memorandum

DATE: February 22, 2002

REPLY TO ATTN OF: Office of Environmental Policy and Guidance: Koss: 6-7964

Final Plan and Guidance to Implement Executive Order 13148 Requirements to Achieve Ozone-Depleting Substance Reductions

TO: Distribution

The final report, "A Plan and Guidance to Implement EO 13148 Requirements to Achieve Ozone-Depleting Substance Reductions," has been attached as a pdf file to this package, and has also been posted on the Office of Environmental Policy and Guidance's (EH-41) Web Site at:

<u>http://www.eh.doe.gov/oepa/guidance/ozone/odseoguide.pdf</u>. The purpose of the report is to provide a plan with guidance for Department of Energy (DOE) program and field elements to implement the ozone-depleting substances (ODS) provisions of Executive Order (EO) 13148.

By establishing a December 31, 2010, Class I ODS procurement termination date, the EO places emphasis on the need for planning to accomplish a long-term, cost-effective Class I ODS use phaseout. In light of the 2010 procurement phaseout date, and the DOE 1999 Pollution Prevention and Energy Efficiency Leadership Goal to eliminate use of Class I ODS by 2010 "to the extent economically practicable," the report recommends that DOE sites complete their plans for ending their use of Class I ODS in all applications for which replacement alternative chemicals and equipment are available. The document endorses the use of the Office of Science's Materials Exchange Web Site for DOE organizations to post information for use by other DOE sites on available ODS that is excess, or on replacement ODS that is needed for remaining uses.

Based on comments received on the draft report, Section 5 and Figure 1 (that both deal with the disposition of Class I ODS) have been revised to more accurately discuss the disposition of radioactively-contaminated ODS, and the possible application of Resource Conservation and Recovery Act (RCRA) requirements to used ODS. This Section also provides detailed guidance for meeting the EO requirement to transfer specific, surplus ozone-depleting chemicals to the Department of Defense for their national security-related applications for which alternative chemicals are not available. Because the disposition of Class I ODS is complicated and subject to a variety of requirements, we recommend that affected DOE elements carefully review Section 5. Although the document provides guidance for DOE sites to make further progress on the use phaseout of Class I ODS, it should be noted that certain requirements discussed in the report are

mandated by existing environmental or property management regulations, or the EO.

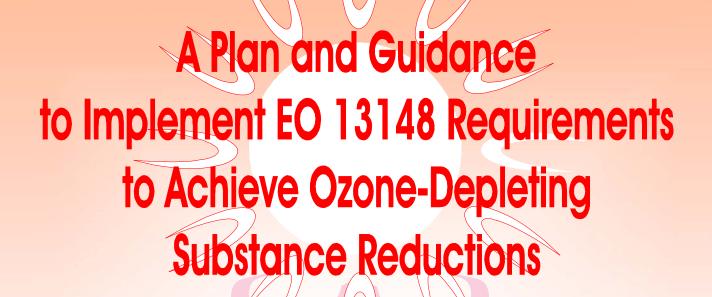
Because the phaseout of ODS affects a broad spectrum of Departmental activities, we ask that the draft report be widely distributed to both DOE and contractor staff involved in the use and phaseout of ozone-depleting refrigerants, Halon compounds used for fire protection, ODS used for laboratory purposes, and ozone-depleting solvents. We also request the submission of information on exemplary ODS phaseout initiatives and successful phaseout projects for posting on EH-41's ODS Web Site (at http://homer.ornl.gov/oepa/ods/phaseouts.html), in order to meet a requirement in EO 13148 to disseminate this information on a Department-wide basis. EH-41 points of contact on ODS issues are Ted Koss (telephone: 202-586-7964; e-mail: theodore.koss@eh.doe.gov) and Emile Boulos (telephone: 202-586-1306; e-mail: emile.boulos@eh.doe.gov).

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U.S. Department of Energy
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February 2002

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LIST OF ABBREVIATIONS

ARI Air-Conditioning And Refrigeration Institute

CAA Clean Air Act

CFCs ... Chlorofluorocarbons

DLA Defense Logistics Agency DoD Department of Defense

DOE Department of Energy

EADS ... Energy Asset Disposal System

EE Office of Energy Efficiency and Renewable Energy

EE-90 ... Office of Federal Energy Management Programs

EH..... Office of Environment, Safety and Health EH-41 ... Office of Environmental Policy and Guidance

EH-53 . . . Office of Nuclear and Facility Safety Policy

EM-20 . . . Office of Integration and Disposition

EO Executive Order

EPA Environmental Protection Agency

FAR Federal Acquisition Regulation

FEDS ... Federal Excess Disposal System

GSA General Services Administration

GWP Global warming potential HCFC . . . Hydrochlorofluorocarbon

HFC Hydrofluorocarbon

HVAC ... Heating, ventilating and air conditioning

ME-60 . . . Office of Procurement and Assistance Management

ME-63 . . . Office of Resource Management

MIC Market Impact Committee MVAC . . . Motor vehicle air conditioner

ODP Ozone-depletion potential

ODS Ozone-depleting substances

RCRA . . . Resource Conservation and Recovery Act

SNAP . . . Significant New Alternatives Policy

SRS Savannah River Site

UNEP . . . United Nations Environment Programme WT-1 Office of Worker and Community Transition

A PLAN AND GUIDANCE TO IMPLEMENT EO 13148 REQUIREMENTS TO ACHIEVE OZONE-DEPLETING SUBSTANCE REDUCTIONS

1. SUMMARY

Executive Order (EO) 13148, "Greening the Government Through Leadership in Environmental Management" establishes an ozone-depleting substances (ODS) phaseout goal, and provides requirements for Federal agencies to reduce their use of ODS. DOE Notice (N) 450.4, "Assignment of Responsibilities for Executive Order 13148, *Greening the Government Through Leadership in Environmental Management,*" specifies organizational responsibilities for incorporating EO requirements into existing Department of Energy (DOE) directives, policies and documents. The purpose of this document is to provide a plan with guidance for DOE program and field elements to implement the ODS provisions of the EO, in accordance with DOE N 450.4. Although this document provides nonmandatory guidelines and recommendations for DOE sites to make further progress on the use phaseout of Class I ODS, it should be noted that certain requirements discussed in the guidance must be complied with because they are mandated by existing environmental or property management regulations, or the EO.

The EO requires that Federal agencies make further progress on the phaseout of their use of Class I ODS (i.e., those chemicals that, when emitted to the atmosphere, are the most destructive to the stratospheric ozone layer). Within the Department, the use of Class I ODS has declined since the early 1990s, and many DOE sites have accomplished much in replacing their ozone-depleting chemicals with suitable alternatives. By establishing a December 31, 2010, Class I ODS procurement termination date, the EO places a new emphasis on the need for planning to accomplish a long-term, cost-effective, Class I ODS use phaseout, which distributes ODS replacement costs over a relatively large number of years. In light of the 2010 procurement phaseout date, and the DOE 1999 Pollution Prevention and Energy Efficiency Leadership Goal to eliminate use of Class I ODS by 2010 "to the extent economically practicable," Sections 3 and 4 of this document recommend that DOE sites and ODS user organizations plan to end their use of Class I ODS in all applications for which suitable replacement chemicals are available. Guidance concerning the development and make-up of site Class I ODS long-term phaseout plans is provided in Section 4. To meet the EO provision to maximize the use of safe alternatives to ODS, DOE user organizations may need to modify or replace existing equipment using these chemicals on a more rapid schedule than would otherwise be the case. Section 4 also provides phaseout guidance for each of the principal DOE ODS use sectors (i.e., the refrigeration and air conditioning sector, the fire suppression and explosion protection sector, and the solvent cleaning sector). In addition, Section 4 provides background information on possible exceptions to the 2010 procurement phaseout and how they may apply to the Department.

Section 5 of the document addresses in some detail the issue of disposing of ODS. It points out that the EO prohibits DOE organizations from exchanging Class I ODS with, or selling it to, outside organizations, unless the chemicals are first offered to the Department of Defense (DoD) for its national security-related, mission-critical applications. In addition, for ODS not needed by DoD, the disposition of the ODS must be managed in accordance with Federal and Departmental property management laws and regulations.

2. Introduction and Background

Executive Order 13148¹, "Greening the Government Through Leadership in Environmental Management," is one in a series of "Greening the Government" Executive Orders developed to establish Federal leadership goals, and implementing strategies and requirements, in the areas of: waste prevention, recycling, and Federal acquisition; efficient energy management; Federal fleet and transportation efficiency; Federal workforce transportation; and environmental management. The preamble of EO 13148 states that its purpose is to develop "environmental accountability" in both daily operations and long-term planning across each Federal agency. The EO assigns the responsibility to each agency head to ensure all necessary actions are taken for meeting the goals and requirements of the order, including those dealing with environmental management systems, environmental compliance, and community right-to-know and pollution prevention.

Section 206 of EO 13148 specifically addresses the reduction of Class I ODS by establishing the goal for agencies to phase out the procurement of all Class I ODS for all nonexcepted uses by December 31, 2010. This is to be accomplished by evaluating present and future ODS usage, and by maximizing the purchase and use of safe, cost-effective, environmentally preferable alternatives. Section 505 of the EO delineates the Section 206 goal by providing requirements on each agency to reduce use and eliminate procurement of ODS. It also precludes agency disposal of ODS without prior coordination with DoD, because some ODS chemicals are critical requirements for certain weapon systems. Section 703 requires each agency to follow the policies and procedures of Federal Acquisition Regulation (FAR) 23.8 and other applicable FAR provisions for the acquisition of items that contain, use, or are manufactured with ODS. The full text of the EO for the Section 206 ODS goal and the Section 505 and 703 requirements on Federal agencies is provided in Appendix A.

This guidance was prepared to meet the requirements of Section 4.f.² of DOE N 450.4, and to meet organizational responsibilities in the Notice related to EO 13148 requirements for a plan. The purpose of this document is to provide implementing measures for DOE program and field offices that use Class I ODS to meet EO requirements. The document discusses the following:

- Ë the implementation of EO requirements;
- E planning activities to meet EO phaseout requirements; and
- Ë the disposal of Class I ODS.

Previously-Issued Department of Energy Requirements and Guidance on ODS Phaseout

DOE Headquarters and Field Elements have been taking actions to reduce the Department's use of ODS since the late 1980s, when worldwide concerns arose about these chemicals depleting the stratospheric ozone layer. The Office of Environmental Policy and Guidance (EH-41), within the Office of Environment, Safety and Health (EH), has the lead within DOE in developing environmental policy and guidance for the implementation of Environmental Protection Agency (EPA) regulatory requirements, and EO requirements and recommendations

¹ EO 13148 can be accessed from the following web site: http://es.epa.gov/oeca/fedfac/cfa/eo13148.htm

http://es.epa.gov/oeca/fedfac/cfa/eo13148.htm

2 Section 4.f. of DOE N 450.4: "Develop a plan to phase out the procurement of Class I ozone-depleting substances (ODSs)

dealing with the phaseout of ODS from the Department's operations. EH-41's Web Site on ODS (http://www.eh.doe.gov/oepa/ods/) is a useful source of information on EPA's stratospheric ozone protection rules, EH guidance to phase out ODS, successful ODS phaseouts at DOE facilities, and other ODS reports and information.

Currently, EPA's regulations dealing with ODS, EO 13148 requirements, and DOE's 1999 Pollution Prevention and Energy Efficiency Leadership Goals³ are the major drivers directing the Department to move towards discontinuing its use of ODS. The ODS Goals 9 and 10 of DOE's directive state:

Goal 9. Retrofit or replace 100% of chillers greater than 150 tons of cooling capacity and manufactured before 1984 that use Class I refrigerants by 2005.

Goal 10. Eliminate use of Class I ODS by 2010, to the extent economically practicable, and to the extent that safe alternative chemicals are available for DOE Class I applications.

Principal ODS-related guidance documents developed by EH-41 are as follows:

- E "Guidance for the Implementation of the Secretarial Memorandum on Replacement or Conversion of Selected DOE Chillers Using Class I Refrigerants," August 1999, developed by EH-41 and the Office of Federal Energy Management Programs (EE-90) (available at: http://tis.eh.doe.gov/oepa/guidance/ozone/chillerguide.pdf)
- Ë "Guidance on the DOE Facility Phaseout of Ozone-Depleting Substances," October 1995 (available at: http://tis.eh.doe.gov/oepa/guidance/ozone/phaseout.pdf)
- Ë "Recommended Approaches to Management of Refrigerants at DOE Facilities," August 1994 (available at: http://tis.eh.doe.gov/oepa/guidance/ozone/ods1994.pdf)

The above-mentioned 1995 guidance document implemented EO 12843 of 1993 ("Procurement Requirements and Policies for Federal Agencies for Ozone-Depleting Substances"). Although EO 12843 has been superseded by EO 13148, the 1995 guidance for EO 12843 has useful information and references that continue to be of value for ODS phaseout planning purposes.

Since the early 1990s, EH has recommended that DOE organizations that are users of ODS develop use phaseout plans. For instance, in May 1993, the memorandum, "Managed Phase Out of Halon Fixed Fire Suppression Systems" recommended that DOE field elements expedite planning for projects to replace Halon systems with alternate means of fire protection. The August 1994 and August 1999 documents cited above provide detailed planning guidance on phaseout strategies for Class I refrigerants at DOE sites.

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³ Available at the following Office of Science Web Site: http://epic.er.doe.gov/epic/bulletin/p2memo.pdf.

⁴ "Managed Phase Out of Halon Fixed Fire Suppression Systems," Memorandum from the Director of Nuclear Safety Policy and Standards, and the Deputy Assistant Secretary of Safety and Quality Assurance, May 5, 1993.

3. IMPLEMENTATION OF SECTION 505(A) REQUIREMENTS TO REDUCE USE OF ODS

Section 505(a) of EO 13148 requires Federal agencies to ensure that their facilities: maximize use of alternatives to ODS; evaluate present and future uses of ODS; and disseminate information on successful ODS phaseout accomplishments.

The Department's major ODS use areas encompass: air conditioning and refrigeration, which includes both comfort cooling and process conditioning; the use of solvents and lubricants in activities such as metal cleaning; fire and explosion suppression; and research applications such as in cryogenic processes. Many of these uses are important to the Department's operations, and the ODS phaseout will require active and comprehensive planning to ensure a smooth transition to the available alternative substances and processes.

To meet a requirement in EO 12843, the Department has inventoried its use of Class I and Class II ODS.⁵ Table I presents Class I and Class II ODS inventory data for the DOE complex, differentiated by ODS use sector. Table I demonstrates that the Department has evaluated its uses of ODS. These data, and other overview information on DOE site phaseout activities in the mid-1990s, are from the EH-41 document, "Report on the Department of Energy's Inventory and Phaseout of Ozone-Depleting Substances," dated November 1997.⁶ The data in the Table for 1997 and 2000 are projections of reductions made for the 1997 report by DOE sites and have not been validated.

As indicated in Table 1, process cooling, refrigeration, and heating, ventilating and air conditioning (HVAC) is DOE's largest use area for Class I ODS. The Table also shows that DOE sites expected to reduce their inventory of both Class I and Class II ODS from 1995 to 2000. The overall DOE Class I use reduction over these five years was projected to be about 30%. This reduction is attributable to increased use of ODS substitutes, and also to reduced and phased out DOE operations.

⁵ Class I ODS are those chemicals listed in Appendix A to Subpart A of 40 *CFR* Part 82 that cause or contribute significantly to harmful effects of the stratospheric ozone layer. Section 602 of the Clean Air Act directs EPA to add to the Class I list any chemical that EPA determines has an ozone depletion potential of 0.2 or greater. Class II ODS are those chemicals listed in Appendix B to Subpart A of 40 *CFR* Part 82 that cause or contribute to harmful effects of the stratospheric ozone layer. Class II chemicals have an ozone-depletion potential less than 0.2. A list of Class I and Class II ODS is provided as

Appendix B of this document.

⁶ Available at the following Web Site: http://www.eh.doe.gov/oepa/guidance/ozone/odssum.pdf.

Table 1. Total Inventory of Ozone-Depleting Substances - DOE Sites^a

Ozone-Depleting Substance	Air Condit	tioning/Refrige	eration (lb.)	Fire S	Suppressio	n (lb.)	Solven	ts/Lubrica	nts (lb.)	Rese	earch/Oth	er (lb.)		Totals (lb.)	
	1995⁵	1997°	2000°	1995 ^b	1997°	2000°	1995 ^b	1997°	2000°	1995⁵	1997°	2000°	1995⁵	1997°	2000°
CLASS I															
CFC-11	456,695	385,015	314,906	0	0	0	48,134	85	82	10	9	7	504,839	385,109	314,995
CFC-12	205,419	183,534	145,868	0	0	0	11,614	4	3	425	160	155	217,457	183,698	146,024
CFC-13	2,748	1,438	22,721	0	0	0	253	0	0	1	1	0	3,002	1,439	22,721
CFC-13b1	237	228	188	0	0	0	0	0	0	320	290	190	557	518	378
CFC-113	58,608	52,991	50,277	0	0	0	231,189	225,233	175,514	1,192	1,063	931	290,989	279,287	226,722
CFC-114	71,887	79,771	23,881	0	0	0	0	0	0	5,404	5,065	45	77,291	84,836	23,926
CFC-115	136	130	110	0	0	0	0	0	0	15	15	15	151	145	125
Halon 1211	0	0	0	112,555	111,966	85,931	0	0	0	0	0	0	112,555	111,966	85,931
Halon 1301	10	10	10	358,768	340,579	279,684	0	0	0	0	0	0	358,778	340,589	279,694
Halon 2402	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon tetrachloride	0	0	0	0	0	0	472	0	0	165	114	60	637	114	60
Methyl chloroform	0	0	0	0	0	0	39,860	16,889	9,678	3,933	1,864	475	43,793	18,753	10,153
CLASS II															
HCFC-21	2	2	2	0	0	0	0	0	0	0	0	0	2	2	2
HCFC-22	911,718	543,615	508,522	0	0	0	98	49	49	56	56	56	911,872	543,720	508,627
HCFC-123	12,300	34,390	48,170	88	176	176	61	122	122	1	1	1	12,450	34,689	48,469
HCFC-141b	0	0	0	0	0	0	281	224	224	100	0	0	381	224	224
HCFC-142b	0	0	0	0	0	0	33	0	0	0	0	0	33	0	0
HCFC-233	0	0	0	0	0	0	50	0	0	0	0	0	50	0	0
OTHER															
CFC-402b	6	6	6	0	0	0	0	0	0	0	0	0	6	6	6
CFC-500	63,743	72,393	58,913	0	0	0	0	0	0	0	0	0	63,743	72,393	56,913
CFC-502	11,542	9,492	5,729	0	0	0	0	0	0	0	0	0	11,542	9,492	5,729
CFC-503	1,585	970	893	0	0	0	0	0	0	0	0	0	1,585	970	893
MP-39	31	31	31	0	0	0	0	0	0	0	0	0	31	31	31
Misc. d	1,753	1,919	1,640	0	0	0	664	95	11	0	0	0	2,417	2,014	1,651
Total	1,798,420	1,365,935	1,181,867	471,411	452,721	365,791	332,709	242,701	185,683	11,622	8,638	1,935	2,614,161	2,069,995	1,733,274

^a From an EH-41 study carried out in the mid-1990s.

b Total actual ODS inventory reported by DOE sites.
c Total inventory projected by DOE sites.
d This includes ODS chemicals and inventory that were only listed by a single site.

EPA's Significant New Alternatives Policy (SNAP)

The overall policy established by Section 612 of the Clean Air Act (CAA) is to replace Class I and Class II ODS by chemicals, product substitutes, or alternative processes that reduce overall risks to human health and the environment, to the maximum extent practicable. Section 612 also required EPA to establish a program to identify alternatives to Class I and Class II ODS and to publish lists of acceptable and unacceptable alternatives. EPA's final rule implementing Section 612 is found at 40 *CFR* Part 82, Subpart G ("Significant New Alternatives Policy Program"). The SNAP program was developed to assist users of ODS in making informed decisions and choices in what alternatives to employ in place of ozone-damaging chemicals. Significant work was accomplished in encouraging manufacturers to develop usable alternatives for all major use areas. In the solvents, refrigerants, and fire protection use sectors, a large number of safe substitutes have been developed and are currently being marketed.

Since the inception of the SNAP program in 1994, EPA has continued to review alternatives and publish lists of acceptable and unacceptable substitutes. Up-to-date lists of acceptable and unacceptable substitutes for refrigeration and air conditioning use; non-aerosol solvent cleaning; aerosol solvents and propellants; solvents used in adhesives, coatings, and inks; and fire suppression and explosion protection, are found at EPA's Stratospheric Ozone Protection Division's Web Site at: http://www.epa.gov/docs/ozone/title6/snap/lists/index.html.

Maximizing the Use of Safe Alternatives

Section 505(a) of the EO requires Federal agencies to maximize the use of safe alternative chemicals to ODS. Not all DOE activities that could result in the potential release of ODS to the atmosphere necessarily fall within the scope of this requirement. For example, existing equipment containing chlorofluorocarbons (CFCs) and Halon may be a potential source of Class I releases, but the EO does not require that such equipment be immediately taken out of service. However, to the extent that the maintenance of such equipment might require the procurement of replacement CFCs or Halon, Section 505 would affect this equipment, because EO 13148 prohibits such procurement as of December 31, 2010. Thus, the mandate to maximize the substitution of safe alternatives to ODS will result in DOE user organizations having to plan to modify or replace existing equipment on a more rapid schedule than would otherwise be the case.

For the continued operation and use of existing equipment that contains Class I ODS, it is important that, to meet the intent of the EO, DOE user organizations take steps to minimize the release of ODS to the atmosphere in all use areas, and to maximize recycling and conservation of the ODS.

The selection of an alternative requires thoughtful, collaborative planning and research, and has many long-reaching implications. There are few "drop-in" alternatives available for the uses that are most common in the DOE complex, except those that are associated with the replacement or retrofitting of the equipment (i.e., refrigeration and air conditioning equipment, or fire protection equipment). The DOE ODS user organization should select alternatives that are SNAP-approved, with an ozone-depletion potential (ODP) of zero whenever possible. If no SNAP-approved alternative with an ODP of zero is suitable for the given application, then the

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Available at the following U.S. Government Printing Office Web Site: <a href="http://ecfr.access.gpo.gov/otcgi/cfr/otfilter.cgi?DB=7&SORTBY=%42%49%42%53%52%54&ACTION=View&QUERY=%34%30&RGN=%42%54%49&OP=and&QUERY=%47&RGN=%42%53%55%42%50%54&OP=and&QUERY=&OP

DOE organization should select an alternative with an ODP of 0.05 or less. It is important that the alternative meet the required performance criteria, and that it be commercially available in sufficient quantities to meet the needs of the application through its expected useful life. The global warming potential (GWP) should also be considered among the candidate alternatives, and the chemical with the lowest GWP should be chosen if performance, ODP, and economics are about equal. Worker safety and health considerations must also be evaluated in choosing a safe alternative. During the planning process, an industrial hygienist or occupational safety and health professional might need to be involved in the selection of a suitable alternative. EPA's Stratospheric Ozone Protection Web Site⁸ has ODP and GWP information, and information on use conditions for some ODS applications and alternatives whose use could cause adverse human health effects. Procedures for safely handling or working with alternative chemicals can also be provided by the manufacturer, either from a Material Safety Data Sheet or other supplemental material.

At the present time, substitution is not required for Class II ODS identified by SNAP as safe alternatives. However, affected DOE organizations should be aware that there is an established <u>production</u> phaseout schedule for Class II substances (see Appendix C). The phaseout schedule should be considered when selecting substitutes. This is especially important if equipment is projected to operate beyond Class II ODS production phaseout dates.

Exemplary Practices and Information on Successful DOE Phaseouts

EH-41 has a Web Site (http://www.eh.doe.gov/oepa/ods/phaseouts.html) devoted to sharing DOE facility ODS phaseout success stories in the refrigeration and air conditioning, fire protection, and ozone-depleting solvent sectors. The dissemination of information on successful ODS phaseout projects will promote their review and possible implementation by other DOE user organizations. As noted earlier, dissemination of information on successful phaseouts is also required by EO 13148. To help achieve this requirement, DOE organizations are encouraged to submit information on exemplary practices and successful phaseout projects for all ODS to EH-41.9

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⁸ Available at http://www.epa.gov/docs/ozone/index.html.

⁹ Summaries of successful ODS phaseout projects can be sent to Ted Koss (e-mail: <u>theodore.koss@eh.doe.gov</u>; telephone: 202-586-7964) or Emile Boulos (e-mail: <u>emile.boulos@eh.doe.gov</u>; telephone: 202-586-1306) of EH-41 for posting on this Web Site.

4. CLASS I ODS USE PHASEOUT PLANNING AS EQUIPMENT REACHES EXPECTED SERVICE LIFE, AND CLASS I ODS PROCUREMENT PHASEOUT PLANNING

Class I ODS Use Phaseout Planning

Section 505(b) of EO 13148 requires Federal agencies to develop plans by April 2001 to phase out procurement of Class I ODS for all nonexcepted uses by December 31, 2010, and it also requires plans to phase out Class I ODS applications in a cost-effective manner to reduce environmental risk as equipment using these substances reaches its expected service life. ¹⁰ This plan and associated guidance is intended to meet these requirements. However, this does not relieve field elements from their responsibility to plan their phaseout activities. DOE field elements need to proactively assess program and project needs to ensure the cost-effective implementation of their phaseout of ODS. Possible exceptions to the 2010 procurement phaseout are discussed in the last subsection of this section.

The overall strategy behind international and U.S. efforts to ultimately phase out the use of Class I ODS consists of the following elements: terminating production of Class I chemicals; encouraging recovery and recycling of Class I refrigerants and Halon; allowing continuing use in existing equipment, until the equipment is replaced; and for Halon, allowing market forces to move Halon from noncritical to critical uses, and reducing Halon air emissions.¹¹

For DOE ODS user organizations, a key activity to accomplish this long-term phaseout strategy is to develop plans for gradually eliminating Class I ODS (and, ultimately, to develop plans to phase out use of Class II ODS). In the absence of such planning, users will find themselves having to pay increasingly high prices for increasingly scarce Class I chemicals, and they also risk running short of Class I chemicals as replenishment for their equipment when overall commercial supplies dwindle. Although stockpiling of needed chemicals can help minimize these risks, stockpiling large quantities of Class I ODS has other inherent risks. As other users phase out equipment that use these chemicals, the need for the chemicals disappears, and large stockpiles will become a liability. The disposal of these chemicals may become prohibitively expensive. Another drawback to stockpiling is that it may promote continuing use of Class I ODS even though safe alternatives are available, thus contributing to preventable environmental detriment. Therefore, it is important for DOE users to develop plans that balance stockpiles with need, consistent with a well-thought-out phaseout schedule. Having too much or too little of these chemicals can result in a costly problem.

Section 505(b) of the EO requires Federal agencies to place a new focus on the need for planning to accomplish a long-term use phaseout of Class I ODS. In the absence of a specific use phaseout date or use elimination requirement at this time, DOE ODS user organizations and DOE sites should plan for the phaseout of the use of Class I chemicals¹² for remaining

¹⁰ It should be noted that EO 13148 does not prohibit the use of Class I ODS in nonexcepted uses after December 31, 2010. However, Goal 10 of DOE's Pollution Prevention and Energy Efficiency Leadership Goals calls for the elimination of Class I ODS in nonexcepted uses, "to the extent economically practicable."

¹¹ EPA, "Halon Management Strategy of the United States of America," prepared in response to Decision X/7 that was taken at the Tenth Meeting of the Parties to the Montreal Protocol, held in Cairo, Egypt, November 1998.

¹² It is recognized that all DOE facilities have carried out studies and planning to eliminate some or all of their usage of Class I chemicals, and that some DOE facilities and organizations have accomplished much in phasing out their use of these chemicals.

equipment for which suitable alternatives are available. Although written phaseout plans are not mandated by the EO. DOE sites should prepare such plans. ODS phaseout plans could be incorporated into overall site pollution prevention plans, which are required to be updated every three years by DOE Order 5400.1, "General Environmental Protection Program."

The ensuing discussion in the rest of this subsection addresses overall strategies in Class I ODS phaseout planning and provides recommendations on the make-up of the plans, but it does not provide detailed instructions for accomplishing the phaseout. The ODS phaseout plans should include the major elements listed in Table 2.

Table 2. Recommended Major Elements of a Plan to Phase Out Use of Class I ODS

inventory of remaining Class I ODS equipment and Class I ODS supplies^a

plans for recovery/recycling/reuse of existing stocks of ODS

prioritization of Halon replacement and chiller replacement/retrofit projects

description of alternatives that will be implemented

time schedule for the conversion or replacement of equipment

Ë estimated or actual costs for plan implementation

disposition of unwanted Class I ODSb

While there may sometimes be substantial financial requirements inherent in making conversions to equipment and processes that do not use these chemicals, ODS user organizations should recognize that time is an important consideration in implementing the phaseout. If careful planning is conducted, what is impracticable in the short-term may be feasible over a longer period of time in the normal budgeting process. For instance, some DOE sites have planned to phase in over several years chiller replacement and conversions for segments of the site having multiple chillers and air conditioning systems, because replacement/conversion costs were high and not easily funded in a one- or two-year budget span.

Class I ODS recovered from removed equipment can be used to service remaining equipment that will be converted in later years. If recovered CFCs and Halon would be insufficient to meet future needs, DOE ODS user organizations should attempt to accelerate their phaseout schedules. Through proper management of existing refrigerant and Halon inventory, maximum use of refrigerant recovery/recycling equipment, minimization of air releases through improved maintenance, and insuring that technicians are properly trained, it will be possible to maximize the useful life of existing CFC and Halon stockpiles and ensure equipment supportability during implementation of a DOE site ODS phaseout plan. 13

^a Detailed recommendations on conducting an inventory of HVAC equipment are found on pages 4-7 of "Recommended Approaches to Management of Refrigerants at DOE Facilities," August 1994 (available at: http://tis.eh.doe.gov/oepa/guidance/ozone/ods1994.pdf).

^b Guidance on this issue is presented in Section 5 of this document.

¹³ Further information on preparing a Class I ODS phaseout plan can be obtained from the U.S. Army reference, "Guide to Preparing Ozone-Depleting Chemical Elimination Plans," available at the Army Acquisition Pollution Prevention Support Office Web Site at: http://www.aappso.com/odc/odcginst/download.html.

DOE program and field elements should determine the prioritization of Class I ODS phaseout projects, which is one of the elements of Table 2. The following should be considered in prioritizing these projects:

- Ë Chillers being retrofitted or replaced to meet Goal 9¹⁴ of DOE's 1999 Pollution Prevention and Energy Efficiency Leadership Goals should be accorded a high priority in the phaseout plan.
- Ë Section 2.1 of EH's and EE's (Office of Energy Efficiency and Renewable Energy) 1999, "Guidance for the Implementation of the Secretarial Memorandum on Replacement or Conversion of Selected DOE Chillers Using Class I Ozone-Depleting Substances as Refrigerants"¹⁵ presents a decision-making methodology for replacing or retrofitting each Class I ODS chiller through a life-cycle-costing approach.
- Ë The phaseout of chillers out-of-compliance with the leak limits of 40 *CFR* Part 82, Subpart F clearly must be a high priority. Likewise, the phaseout of chillers only marginally in compliance with standards should be a high priority.
- Ë Because it is likely that the available supply of specific CFC refrigerants (e.g., CFC-11, CFC-114) will decline at different rates in upcoming years, DOE ODS user organizations should establish and maintain working relationships with commercial refrigerant suppliers and consider long-term refrigerant availability as a factor in chiller phaseout prioritization decisions.
- Ë Equipment (both chillers and Halon systems) with the largest quantity of Class I ODS might be replaced early on, so that the removed ODS could be used to supply smaller systems for a longer period of time.

One of the major considerations of phaseout planning involves the concepts of "expected service life," or "economic life," or "expected useful life" of equipment. While exact definitions of each of these phrases may differ somewhat, they all deal with the concept of when does the equipment wear out, or when does it cost as much to maintain it as replace it. For chillers, and fire extinguishing systems using Halon, there are no commonly-accepted principles that might help define what the expected service life of a given piece of equipment might be. The expected service life of such equipment can often be extended by replacement of worn parts and other attentive maintenance practices. In fact, because of budgetary constraints on purchases of new equipment, extended, long-term use of existing equipment is often the norm at Federal facilities. The question of ODS availability must also be considered in the "expected service life" question. If a DOE organization cannot get the "parts" (including ODS) to keep the equipment operating, and replacement "parts" are not available, then the equipment has exceeded its useful life.

Use Phaseout of Class I Refrigerants

The Department has been making substantial progress for a number of years in its long-term phaseout of Class I refrigerants. DOE efforts in this area have intensified as a result of a December 10, 1998, memorandum, "Phaseout Goal for DOE's Air-conditioning and

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¹⁴ Goal 9: Retrofit or replace 100% of chillers greater than 150 tons of cooling capacity and manufactured before 1984 that use Class I refrigerants by 2005.

¹⁵ Available at the EH-41 Web Site at: http://tis.eh.doe.gov/oepa/guidance/ozone/chillerguide.pdf.

Refrigeration Chillers to Protect the Ozone Layer and to Reduce Energy Costs."¹⁶ In the memo, DOE established the goal to replace or retrofit DOE air-conditioning and refrigeration chillers using Class I refrigerants that are greater than 150 tons of cooling capacity and were manufactured before 1984. The memo also requested that DOE sites plan for the eventual phaseout of all remaining refrigeration and air conditioning equipment that uses Class I refrigerants. The accomplishment of this goal will bring about the accomplishment of the long-term ODS use phaseout provisions of Section 505(b) of the EO for DOE's refrigeration and air conditioning sector.

To establish a program to implement this phaseout, EH-41 and EE-90 (Office of Federal Energy Management Programs) released, "Guidance for the Implementation of the Secretarial Memorandum on Replacement or Conversion of Selected DOE Chillers Using Class I Refrigerants" (see Footnote 15 for Web Site) in August 1999. The phaseout of chillers using ozone-depleting refrigerants and the refrigerant management planning concepts discussed in Chapter 2 of the 1999 guidance apply, not only to the greater-than-150-ton capacity chillers using Class I refrigerants built before 1984 (which are the chillers subject to Goal 9 of the Department's 1999 Pollution Prevention and Energy Efficiency Leadership Goals), but also to all other chillers using Class I substances. Thus, DOE sites should continue to utilize the 1999 guidance to develop long-term plans suitable for their specific site circumstances that will ultimately eliminate their remaining refrigeration and air conditioning chillers using Class I refrigerants.¹⁷

Use Phaseout of Halon Compounds

DOE uses Halon extensively throughout the complex for fire suppression and explosion protection. Although Halon compounds are very effective fire extinguishing agents, they are also very substantial depleters of the stratospheric ozone layer. Halon 1211 and 1301 have the highest ozone-depletion potential of all ODS. The principal DOE policy directive dealing with the phaseout of Halon is a 1990 memorandum¹⁸ that prohibited the installation of new fire suppression systems using Halon compounds in DOE facilities.

Guidance¹⁹ developed in 1993 by the Office of Nuclear and Facility Safety Policy (EH-53), and 1995 EH-41 guidance²⁰, both of which recommended that DOE field elements develop plans to replace Halon systems with alternate means of fire protection, have also promoted a reduction in Halon use. Annual Halon inventory data collected by EH-53 indicate that DOE field elements using Halon have significantly reduced their use of both Halon 1301 and Halon 1211. In accordance with existing DOE fire protection procedures, DOE fire protection organizations should ship unneeded removed Halon 1301 to the DOE Halon repository at the Savannah River

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¹⁶ Available at the EH-41 Web Site at: http://tis.eh.doe.gov/oepa/guidance/ozone/chillers.pdf.

¹⁷ The August 1994 EH-41 predecessor guidance, "Recommended Approaches to Management of Refrigerants at DOE Facilities," provides additional detail for Class I refrigerant equipment phaseout planning. This guidance is available at: http://tis.eh.doe.gov/oepa/quidance/ozone/ods1994.pdf.

¹⁸ "Interim Position on the Installation of New Halon 1301 Fixed Fire Suppression Systems and Halon Portable Fire Extinguishers," Memorandum from the Acting Deputy Assistant Secretary of Safety and Quality Assurance, and the Acting Director of the Office of Projects and Facilities Management, September 27, 1990.

¹⁹ "Managed Phase Out of Halon Fixed Fire Suppression Systems," Memorandum from the Director of Nuclear Safety Policy and Standards, and the Deputy Assistant Secretary of Safety and Quality Assurance, May 5, 1993.

²⁰ "Guidance on the DOE Facility Phaseout of Ozone Depleting Substances," October 1995. Available at the EH-41 Web Site at: http://tis.eh.doe.gov/oepa/guidance/ozone/phaseout.pdf.

Site (SRS).²¹ Although Halon 1301 is available from SRS for replenishment, DOE fire protection organizations should continue their Halon phaseout for applications for which substitutes are viable, consistent with Section 505(b) of EO 13148. Ultimately, when DOE no longer needs to stockpile Halon 1301 at SRS for its applications, the Department will need to establish procedures to transfer the Halon to DoD for their national security-related, mission-critical applications, as required by Section 505(c) of the EO.

The material in the following paragraph is presented as guidance for use by fire protection engineers and managers in the gradual phaseout of Halon 1301 fixed-fire suppression systems for which alternative agents could be used in place of the Halon. This strategy is based on the U.S. Navy's requirements and approach for converting shore-based Halon 1301 systems for which there are acceptable alternative agents to replace the Halon for the particular application.²²

Halon 1301 in installed fire protection systems is not normally released to the atmosphere unless there is a catastrophic failure or a fire. However, should a discharge occur because of a fire or accident, consideration should be given to not refilling the system with Halon 1301. Many DOE facilities that are currently protected with Halon 1301 can be adequately protected with existing water sprinkler systems. If an accidental discharge or fire should occur in this situation, there would be no need to replace the Halon 1301 in the system or to replace the system with an alternative agent. However, some hazards currently protected by Halon 1301 cannot be adequately protected with water sprinkler systems alone. ^{23, 24} If an accidental discharge or fire should occur in one of these spaces, the system should not be refilled with Halon 1301. Rather, it should be retrofitted or replaced with an approved alternative agent (such as Carbon dioxide, or gaseous clean agents, or water mist), if feasible. ²⁵

Portable Halon fire extinguishers using Halon 1211 or Halon 1301 should be removed from facilities and replaced with suitable, SNAP-approved fire protection agents (such as Carbon dioxide, gaseous clean agents, pressurized water or dry chemicals). For situations in which alternative agents are not available (such as certain aviation applications), continued use of Halon would be appropriate until suitable replacements are developed and can be deployed (see subsection, "Exceptions to Class I ODS Procurement and Use Phaseout," in this Section, below). Excess hand-held portables should be processed to safely recover the Halon and avoid any potential inadvertent releases due to mishandling, or equipment valve failures.

Use Phaseout of Class I Solvents

One of the ODS use sectors for which major, worldwide progress has been made since 1990 in replacing ODS with new alternative chemicals and processes is the solvent cleaning sector. Recommendations from EH-41's 1995, "Guidance on the DOE Facility Phaseout of Ozone-Depleting Substances" continue to be applicable:

²¹ Details on the disposition of Halon 1301 and 1211 are provided in Section 5, "Disposition of Class I ODS."

²² U.S. Navy, "OPNAVINST 5090.IB CH-2," Chapter 6, "Management of Ozone-Depleting Substances," September 9, 1999.

²³ Examples include gloveboxes or hot cells handling pyrophoric and/or water-reactive materials.

²⁴ Also, in some cases, the Halon system may be credited as the redundant fire protection system for property protection criteria established by DOE (e.g., DOE Order 420.1, Section 4.2.2.4; "Implementation Guide for Use with DOE Orders 420.1 and 444.1, Fire Safety Program," Section IV.9.7).

²⁵ Since there are no drop-in replacements for Halon 1301 in fixed systems, use of an alternative agent would require reengineering the system.

- Ë DOE user organizations should not procure Class I ozone-depleting solvents, except when no suitable substitutes are available, or are required by DoD military specifications, Federal specifications, or EPA technical requirements.
- Ë DOE user organizations should develop and implement plans for phasing out the use of ozone-depleting solvents. (This would not apply to uses involving DoD military specifications, EPA technical requirements, or other Federal specifications. For these uses, the ozone-depleting solvent use should be phased out when the specifications are changed.)
- Ë DOE user organizations should use engineering best management practices to reduce Class I and Class II ODS emissions, where economically practicable. These practices include, but are not limited to:
 - improving efficiency of cleaning operations,
 - eliminating processes that use ODS,
 - using new technologies and existing, alternative processes that minimize or eliminate emissions, and
 - recovering and recycling ozone-depleting solvents.

December 31, 2010 Class I ODS Procurement Phaseout

To meet the mandate in Section 505(b), EH plans to coordinate, and issue a directive in calendar year 2002, that will require that Departmental elements terminate procurement of Class I ODS for all nonexcepted uses by December 31, 2010. The Office of Procurement and Assistance Management (ME-60) will also reissue its Greening the Government Acquisition Letter to include EO 13148, "Greening the Government through Leadership in Environmental Management," as well as EO 13149, "Greening the Government though Federal Fleet and Transportation Efficiency." The coverage for EO 13148 will include guidance to ensure that acquisition personnel are aware of Section 505(b)'s direction to phase out procurement of Class I ODS and Section 701's direction limiting the procurement of toxic chemicals, hazardous substances and other pollutants.

Exceptions to Class I ODS Procurement and Use Phaseout

Section 505(b) of the EO allows exceptions to the mandatory December 31, 2010, Class I ODS procurement phaseout mentioned in Section 505(b). These exceptions, "include all exceptions found in current or future applicable law, treaty, regulation, or Executive Order."

The Montreal Protocol is the international agreement to reduce and eventually eliminate production of all ODS. As of January 1996, production and import of Class I ODS (except Methyl Bromide) were discontinued in all developed countries, including the United States. However, in recognition that alternatives would not be available by that date for certain important products, the signatory nations (called Parties) to the Montreal Protocol established a process for exempting certain "essential" specific uses from the Montreal Protocol's production and import bans. This process allows for the continued production of Class I ODS for these specific essential uses.

It is important to note, however, that the Parties to the Montreal Protocol did not intend to establish permanent essential use exemptions. Rather, the Parties anticipated that alternatives for the ozone-depleting chemicals used in exempted products would be developed. Once

alternatives have been developed which are technically and economically feasible, and acceptable from the standpoint of health and the environment, essential use exemptions would be phased out.

Title VI ("Stratospheric Ozone Protection") of the 1990 CAA Amendments implement the requirements of the Montreal Protocol in the United States. In EPA's implementing regulations on Production and Consumption Controls, the Agency provides the following definition of "essential uses" at 40 *CFR* Section 82.3:

"Essential-Uses" means those uses of controlled substances designated by the Parties to the Protocol to be necessary for the health and safety of, or critical for the functioning of, society; and for which there are no available technically and economically feasible alternatives or substitutes that are acceptable from the standpoint of environment and health. Beginning January 1, 2000 (January 1, 2002 for methyl chloroform) the essential use designations for Class I substances must be made in accordance with the provisions of the Clean Air Act Amendments of 1990.

Possible exceptions to the Class I ODS Procurement and Use Phaseout of the EO that may be of relevance to DOE are listed in Table 3. The first two exceptions relate to <u>potential</u> exemptions from production phaseout requirements in the 1990 CAA Amendments that would enable EPA through the rulemaking process to allow limited production in the U.S. of specific Class I chemicals for essential uses. As of February 2002, however, EPA has not proceeded on rulemaking activities for these two exceptions. Although currently there are no viable alternatives for Halon 1211 and 1301 for certain aviation safety uses, sufficient Halon inventory is available in the U.S. such that further production for this essential use is not warranted. Also, concerning the second potential exemption related to national security, DoD has established a repository to stockpile Class I chemicals for those applications for which alternatives are not available.

For the year 2001, the Parties to the Montreal Protocol granted the U.S. an essential use exemption for the production of small quantities of certain high-purity Class I substances and mixtures for laboratory and analytical uses (which is the third entry of Table 3). The following laboratory uses qualify for this exemption:

Laboratory purposes are identified at this time to include equipment calibration; use as extraction solvents, diluents, or carriers for chemical analysis; biochemical research; inert solvents for chemical reactions, as a carrier or laboratory chemical and other critical analytical and laboratory purposes.²⁶

Even though this exemption is not explicitly identified in Section 604 of the CAA, EPA made the determination at 66 FR 14760 that production and import of small quantities of Class I ODS for laboratory and analytical uses in 2001 is allowable as a *de minimis* use under the CAA. The global laboratory and analytical essential use exemption lasts until December 31, 2005. The Parties will further examine this exemption in the future.

²⁶ From Appendix G to Subpart A of 40 *CFR* Part 82 – United Nations Environment Programme (UNEP) Recommendations for Conditions Applied to Exemptions for Laboratory and Analytical Uses.

Table 3. Identified Exceptions to Class I ODS Phaseout Potentially Applicable to DOE Operations

EXCEPTION	CITATION
Halon-1211, -1301, -2402 for aviation safety ^a	CAA Section 604(d)(3)
CFC-114; Halon -1211, -1301, -2402 to protect U.S. national security interests ^b	CAA Section 604(f)
Laboratory and analytical essential uses for Class I ODS ^c	40 CFR Section 82.4(t); 66 FR 14760, 3/13/01

^aA production exception is allowed if the Administrator of the Federal Aviation Administration determines that no safe and effective substitute has been developed, and the exception is needed for aviation safety.

^cAt 66 *FR* 14760, EPA issued a direct final rule to provide an exemption for laboratory and analytical essential uses for calendar year 2001. In the direct final rule, EPA determined that an allowance for these essential uses is allowable under the CAA as a *de minimis* exemption. This rule affects DOE laboratories that purchase newly-produced or imported Class I ODS in that such a purchase results in the need to provide a certification to the producer, importer, or distributor of the ODS (see the EH-41 memorandum on this rule, which is available at: http://homer.ornl.gov/oepa/guidance/caa/odsmemo.pdf).

Table 4 lists specific DOE applications using Class I ODS for which alternatives for the ODS may not be available. The material in the Table was developed from information collected by EH from DOE field elements in the early- and mid-1990s. It is likely that at this time, suitable alternatives for some of these applications have been developed, and that some of the applications are no longer in use. It should also be noted that some of the DOE applications are unique, and that ODS replacements for these may not be feasible.

At this time, it is uncertain as to which (if any) exceptions to the 2010 Class I ODS procurement phaseout might be available to DOE users of these chemicals. EH-41 will track and disseminate information on future EPA actions concerning exceptions that may be relevant to the Department. DOE and DOE contractor staffs need to bear in mind that, since Section 505 of the EO requires Federal agencies to maximize the use of safe alternatives to ODS, they need to keep abreast of, and employ, where practicable, these alternatives. DOE ODS user organizations also need to keep in mind that the overall philosophy behind the "essential use" designation of these chemicals is that exceptions to the ODS phaseout are not permanent, and that these exceptions will be eliminated when technological advances produce viable substitutes. DOE users should consider re-engineering the DOE application in order to replace the Class I ODS if an appropriate opportunity arises (e.g., during a lengthy outage associated with equipment maintenance or repair), or to replacing the equipment using the Class I ODS. If long-term usage of the Class I ODS application is anticipated, and substitutes are not feasible. then DOE users may need to stockpile Class I ODS, under the premise that future supplies will ultimately be unavailable. For this situation, the replenishment rate of Class I ODS for the application should be carefully evaluated to avoid storing an excessive quantity of chemicals.

^bA 1-year production exception is allowed if the President finds that adequate substitutes are not available. Additional 1-year exemptions may be granted.

Table 4. Examples of DOE Applications Using Class I ODS for Which Alternatives to the ODS May Not Be Available^a

APPLICATION	CLASS I ODS
nuclear reactors nuclear material processing and storage facilities ^b portable and mobile facilities ^c aircraft deep tunnels ^d super computers power generation/distribution facilities ^e	Halon Halon Halon Halon Halon Halon Halon
geographically-remote facilities ^f air conditioning for custom-designed and high-security vehicles refrigeration in specialized work areas and specialized labs ODS-containing systems: air dryers, growth chambers, walk-in coolers and freezers degreasing helium transfer lines laboratory and research applications ^g	Halon various refrigerants various refrigerants various refrigerants 1,1,1-trichloroethane various Class I ODS

^a based on information collected by EH from DOE organizations in the early- and mid-1990s; this listing is not intended to be exhaustive

^b facilities that process materials such as uranium, plutonium and other radionuclides. Most of these applications utilize small Halon systems located in glove boxes, vaults or cells.

^c includes portable trailers which contain data collection equipment that is used during nuclear testing, and emergency response vehicles used for environmental monitoring after a release of radioactive material following an accident

^d These facilities include linear accelerators, hazardous waste repositories and petroleum storage facilities.

^e These facilities include control and power distribution facilities, such as those operated by the Bonneville Power Administration and the Western Area Power Administration.

fixed structures housing data-gathering equipment (e.g., communications systems) at locations where there are no utilities

⁹ A number of DOE sites identified Class I ODS usage for which no substitutes were available in a variety of research applications, such as: the use of carbon tetrachloride in bench scale quantities as a reagent in chemical reactions or as an extraction solvent; the use of CFC-12 as a detector gas; the use of CFC-113 in electrical oscillators, amplifiers, and analytical laboratory methods for environmental restoration; and the use of CFC-12 as a refrigerant in experimental research equipment.

5. DISPOSITION OF CLASS I ODS

Section 505(c) of the EO requires each Federal agency to amend its personal property management policies and procedures to preclude the disposal of ODS removed from its equipment (including disposal as part of a contract, trade, or donation) without prior coordination with DoD. Furthermore, if the removed ODS are a critical requirement for DoD missions, the Federal agency is required to transfer the chemicals to DoD. The requirement to transfer unneeded ODS to DoD does, however, allow the reuse of the ODS within DOE. If a DOE site has no further need for the ODS, and another site could use the ODS, it would save the Department money if the chemicals were transferred to the site needing the ODS.

As more equipment and processes using ODS are replaced or retrofitted throughout the DOE complex, the question of what to do with the removed ODS assumes increasing importance. Figure 1 presents a decision tree for the disposition of all Class I ODS chemicals that are used at Departmental facilities. It should be noted that certain actions in Figure 1 are mandated by EO 13148, or by DOE orders, or governing environmental and property regulations.²⁷ These actions are shown as "must" statements. Other actions without the "must" identifier in Figure 1 are recommended procedures.

In the document, "Guidance for the Implementation of the Secretarial Memorandum on Replacement or Conversion of Selected DOE Chillers Using Class I Ozone-Depleting Substances as Refrigerants" issued in August 1999, information was provided on the disposition of the Class I refrigerants removed from replaced and retrofitted chillers. Figure 1 is a revision and update to the flow chart for Class I refrigerant included with the 1999 implementation guidance. Figure 1 incorporates the EO Section 505(c) requirement to coordinate disposition of Class I ODS with DoD, and it provides information on the disposition of all Class I ODS chemicals (including chemicals not wanted by DoD). The Department plans to coordinate and issue a directive to implement the Section 505(c) requirement concerning the transfer of ODS to DoD. Also, the Office of Resource Management (ME-63) is currently preparing a Department-wide property management guide that will incorporate the requirements of Section 505(c).

The disposition of these chemicals can be broken down into five steps:

Step 1. Onsite ODS Utilization

As Figure 1 shows, the first step in the disposition process is to determine whether Class I ODS removed from equipment at a DOE site should be stockpiled onsite to service other equipment still using the Class I chemical. As indicated in Table 2 of Section 4, a site phaseout plan for Class I ODS use sectors should address this issue.

Step 2. DOE ODS Utilization

If it has been determined that there is no need for removed ozone-depleting solvents, refrigerants and Halon 1211 as a reserve supply for other onsite equipment, then the unneeded Class I ODS should be made available to other DOE sites through the DOE Materials Exchange

²⁷ A list of EPA stratospheric ozone protection regulations and property management regulations, with accompanying regulatory citations, that are relevant to the phaseout and disposition of Class I ODS is provided as Appendix D.

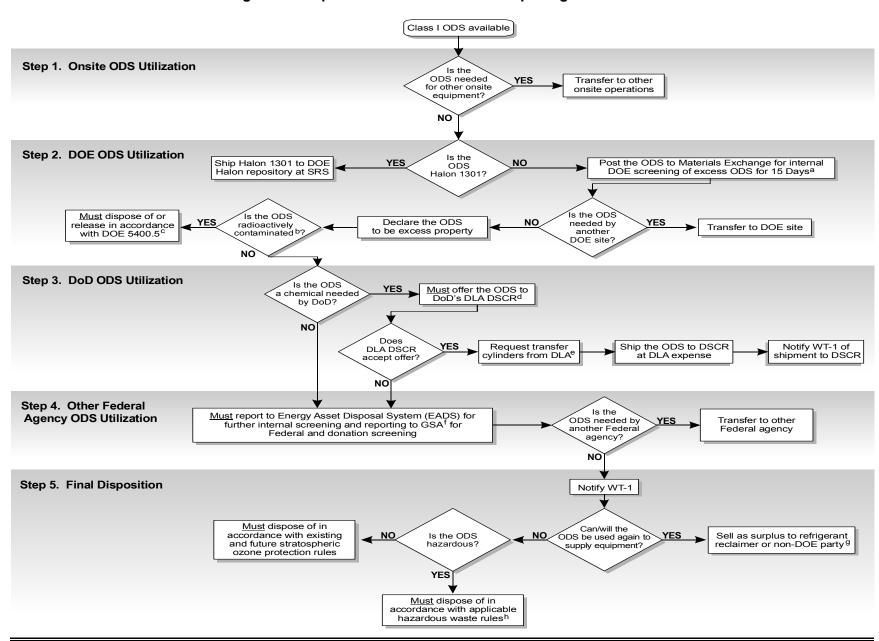


Figure 1. Disposition of Class I Ozone-Depleting Substances

Figure 1. Footnotes

- ^a Excess Class I ODS should be advertised as available for reuse within the Department on the DOE Materials Exchange system. The Materials Exchange is a password-protected site (Web Site: http://wastenot.er.doe.gov/doematex). Contact Arnold Edelman (301) 903-5145 for additional information and access.
- ^b DOE Property Management Regulations (41 *CFR* Section 109-43.307-2.50) require that all hazardous or suspected hazardous material be checked by environmental, safety and health personnel to prevent the inadvertent release of contaminated material to the public (41 *CFR* 109-44.702-3 and 41 *CFR* 109-45.309-2.50). Only contamination-free chemicals are to be released. Radiologically-contaminated chemicals would need to be retained by DOE and handled in accordance with DOE Order 5400.5.
- In addition to meeting the requirements of DOE Order 5400.5, the DOE organization responsible for the ODS also needs to make a Resource Conservation and Recovery Act (RCRA) hazardous waste determination, if the radioactively-contaminated ODS is headed for disposal. The hazardous waste determination will evaluate whether the ODS must be disposed of in accordance with applicable hazardous waste regulations (in addition to meeting the requirements of DOE Order 5400.5.)
- d DoD Defense Logistics Agency Defense Supply Center Richmond. Information on contacting DLA staff in Richmond can be found at their Web Site: https://www.denix.osd.mil/denix/Public/News/DLA/ODS/odsres.html.
- ^e Contact DSCR to request transfer cylinders and the prepaid shipping instructions.
- ^f The General Services Administration (GSA) Federal Excess Disposal System (FEDS) is used to screen excess property for other Federal Agencies and donation programs.
- ⁹ The provisions of the 40 *CFR* Part 82, Subpart F Regulations ("Recycling and Emissions Reduction") that apply to the sale of used refrigerant are found at 40 *CFR* Section 82.154(g) 40 *CFR* Section 82.154(h).
- ^h The DOE organization responsible for the ODS should also examine provisions of the Stratospheric Ozone Protection Regulations of 40 *CFR* Part 82 to determine whether there may be additional requirements related to the destruction and disposition of ODS that may apply.

Web Site.²⁸ However, unneeded Halon 1301 should be shipped directly to the DOE Halon repository at SRS (without the need for advertising its availability on the Materials Exchange).²⁹ Ultimately, when the Department no longer needs to stockpile Halon 1301 at SRS for its uses, DOE will need to establish procedures to transfer the Halon to DoD.

If other DOE sites do not express interest in acquiring the unneeded ODS within 15 days, then the DOE organization responsible for the chemical needs to arrange to have the chemical declared excess property, to be managed in accordance with Federal and Departmental property management regulations, as required by 41 *CFR* 109-43.3. The organization responsible for the excess Class I ODS should confer with the DOE site organization in charge of property disposition to ensure that appropriate procedures are followed. Class I ODS declared excess need to be documented in the appropriate property inventory systems.³⁰ The amount, type and location of all excess ODS should be compiled into a single, property inventory-linked document for disposition tracking purposes and maintained by organizational property management officers.

DOE Property Management Regulations (41 *CFR* Section 109-43.307-2.50) require that ODS that may be transferred or sold outside of DOE <u>must</u> first be checked by environmental, safety and health personnel to prevent the release of contaminated chemicals, as Figure 1 shows. The only contamination of concern for refrigerants and Halon is radiological contamination. Contamination-free property is eligible for immediate release.

If the ODS is found to be radioactively-contaminated, it <u>must</u> be disposed of or released in accordance with DOE Order 5400.5. DOE Order 5400.5 provides criteria and processes for developing and approving "authorized limits" for controlling the release of property containing small amounts of residual radioactive material. Depending on the specific nuclides, the form, and the quantities and concentrations involved, possible disposition paths may include unrestricted release or reuse, restricted release or reuse, or disposal under a variety of regulatory schemes.³¹ In addition to meeting the requirements of DOE Order 5400.5, the DOE organization responsible for the ODS also needs to determine if the ODS is subject to RCRA

²⁸ The Materials Exchange Web Site was developed by DOE's Office of Science to facilitate the complex-wide reuse of unneeded items across the DOE complex. While many DOE sites have their own materials exchange systems, this Web Site is the first of its kind to link many DOE sites into a single clearinghouse for excess items that are not covered under the excess property system. The Materials Exchange contains available or wanted information on ODS and other chemicals, as well as information on equipment, metals, supplies, and other miscellaneous items. The Web Site is located at: http://wastenot.er.doe.gov/DOEmatex/login.asp. An identification number and password for access to the system can be obtained from the directions on the login page on the Exchange Web Site.

²⁹ In accordance with existing DOE fire protection procedures and practices, DOE field elements have been shipping their removed and excess Halon 1301 to the Savannah River Halon storage and recovery facility, where the Halon is stored for replenishment of systems for which suitable Halon 1301 substitutes may not be available. Information on the Savannah River Halon storage and recovery facility can be obtained from the Safety Division, Assistant Manager for Environment, Safety, Health, and Quality of the Savannah River Operations Office (David Boyll is the contact; telephone: 803-952-8000; e-mail: david.boyll@srs.gov. Property transfer and shipping instructions on transferring Halon 1301 to SRS are available on the EH-53 Web Site at: http://tis.eh.doe.gov/fire/guidance/halons1.pdf.

³⁰ The system should comply with the basic standards described at 41 *CFR* 109-1.50 (41 *CFR* 109-1.52 relates to contractors). Chapter 2.3 of the DOE Handbook, "Chemical Management," (DOE-HDBK-1139/1-2000 [Nov. 2000]) specifically discusses chemical inventory and tracking standards. Although systems will differ among DOE sites, certain basic management data such as type, quantity, and location are required by the referenced citations.

³¹ Questions concerning the applicability of DOE Order 5400.5 should be directed to Ed Regnier (202-586-5027; e-mail: edward.regnier@eh.doe.gov) or Andrew Wallo (202-586-4996; e-mail: andrew.wallo@eh.doe.gov) of EH-41.

requirements, if the ODS is destined for disposal. The possible applicability of RCRA requirements is discussed below under "Step 5. Final Disposition."

Step 3. DoD ODS Utilization

As shown in step 3 of Figure 1, all DOE excess Class I ODS needed by DoD <u>must</u> be offered to DoD's Defense Logistics Agency (DLA), to meet the requirement in Section 505(c) of the EO.³² Located at the Defense Supply Center in Richmond, Virginia, the DLA ODS reserve consists of the following chemicals:

Table 5. Ozone-Depleting Chemicals in the DoD ODS Reserve

	CHEMICAL NAME	Symbol
CFCs		
CFC-11	Trichlorofluromethane	CCl₃F
CFC-12	Dichlorodifluromethane	CCI ₂ F ₂
CFC-114	Dichlorotetrafluroethane	C ₂ Cl ₂ F ₄
R-500°	(See note below)	CF ₂ Cl ₂ /C ₂ F ₂
R-502 ^b	(See note below)	CF ₂ CI/C ₂ F ₅ CI
Halons		
Halon 1202	Dibromodifluromethane	CF ₂ Br ₂
Halon 1211	Bromochlordifluromethane	CF₂ClBr
Halon 1301	Bromotrifluromethane	CF₃Br
Solvents		
Methyl chloroform	1,1,1 Trichloroethane	CH ₃ CCl ₃
CFC-113	Trichlorotrifluoroethane	C ₂ F ₃ Cl ₃

^aAzeotropic mixture of CFC-12 and HFC-152a (1,1 Difluroethane)

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From communications with DLA³³, only the Table 5 ODS chemicals that have been excessed by DOE need to be transferred to DLA. As Figure 1 shows, other ODS chemicals follow a different disposition path. The transfer offer to DLA needs to be documented by completing a SF 122, "Transfer Order Excess Personal Property." A copy of the SF 122 needs to be provided to the DOE site's regional GSA office. The SF 122 needs to be forwarded to DLA via facsimile on 804-279-4970. To coordinate transfer actions, DLA can be reached at 804-279-4525. DLA will review the transfer offer and, if accepted, provide the DOE site with transfer cylinders and funding to cover transportation costs.³⁴ If the offer is not accepted, then the DOE organization

^bAzeotropic mixture of CFC-115 and HCFC-22

³² The DLA Web Site for ODS is: https://www.denix.osd.mil/denix/Public/News/DLA/ODS/odsres.html.

³³ "Questions Concerning Transfer of Ozone-Depleting Substances (ODS) to DoD," e-mail from Joe Schmierer, DLA Defense Supply Center in Richmond, to Theodore Koss, EH-41, October 30, 2001.

³⁴ Although DLA has indicated that they will pay transportation costs irrespective of the size of the shipment, they prefer that the transportation costs of a single shipment exceed \$250, in order to minimize their administrative processing costs. To accomplish this, DLA has requested consolidating quantities to be shipped, if feasible.

responsible for the ODS needs to follow the disposition path shown in Figure 1. The transfer cylinders should be shipped to the following address:

Defense Depot Richmond Virginia SWO400 Cylinder Operations 8000 Jefferson Davis Highway Richmond, VA 23297-5900

Upon arrival of an accepted ODS shipment, DLA will inventory the contents and annotate its receipt, using the SF 122. DOE sites will need to retain a completed copy of the SF 122 in their property management files. DoD has a need for many of the different Class I chemicals that are used at DOE facilities, primarily for weapons systems for which suitable substitutes are not available. DLA has requested that the DOE organization responsible for the Class I ODS contact DLA early in the disposition process³⁵ concerning DLA ODS chemical requirements (which may vary over time, depending upon DoD's needs and each chemical's stockpile inventory). DLA procedures indicate that the solvents CFC-113 and Methyl chloroform will be accepted only if they are in their original containers in which the seal has never been broken.

Figure 1 also shows that the DOE organization responsible for the ODS needs to notify DOE's Asset Management Program in the Office of Worker and Community Transition (WT-1)³⁶ as to the type and quantity of ODS transferred to DLA. As the DOE representative to the Market Impact Committee (MIC), WT-1 is the point of contact with DLA concerning DoD's ODS stockpile. MIC was set up by the President to advise the Stockpile Administrator on the economic impacts, both domestic and international, of the disposition of materials, including Class I ODS. WT-1 needs the information on transferred ODS to meet several reporting requirements.

In summary, the following actions should be taken in Step 3 to determine whether excess ODS should be transferred to DoD and to accomplish the transfer: (1) use Table 5 to determine if the excess ODS is needed by DoD; (2) contact DLA to discuss DLA requirements; (3) obtain transfer cylinders from DLA; (4) transfer ODS to DLA; and (5) notify WT-1 about the transfer.

If a Federal agency has personal property that needs to be replaced, the agency can often exchange or sell that property and apply the exchange allowance or sales proceeds to the acquisition of similar replacement property. However, pursuant to 41 CFR Section 101-46.204(a)(1), this exchange/sale authority does not apply to chemicals. Also, the language of Section 505(c) prohibits the use of exchange/sale authority for Class I ODS needed by DoD.³⁷

³⁶ Staff contacts at WT-1 are Jack Blanchard (202-586-6703; e-mail: <u>Jack.Blanchard@hq.doe.gov</u>) or Robert Wilson (202-586-4718; e-mail: <u>Robert.E.Wilson@hq.doe.gov</u>).

³⁷ ME-63 has responsibility for issues associated with the Federal and DOE Property Management Regulations (contacts: Jerry Hanley: 202-586-6681; e-mail: <u>jerry.hanley@pr.doe.gov</u>, or John Carpenter: 202-586-4157; e-mail: <u>john.b.carpenter@pr.doe.gov</u>).

³⁵ See the DLA Web Site referenced in Footnote 32 for information on contacting DLA, and for current procedures for transferring ODS to DLA.. A staff contact to coordinate donations is Joe Schmierer (804-279-5902; e-mail: jschmierer@dscr.dla.mil).

Step 4. Other Federal Agency Utilization

For excess Class I ODS that DoD does not need, existing regulations require that GSA <u>must</u> be notified so that they can advertise its availability throughout the Federal sector. As Figure 1 shows, the DOE organization responsible for the ODS is required to proceed with further Federal disposal actions by reporting the excess ODS information to the DOE-wide Energy Asset Disposal System (EADS)³⁸, in accordance with 41 *CFR* Section 109-43. The EADS process also handles the notification of GSA.

Step 5. Final Disposition

As Figure 1 shows, the DOE organization responsible for the excess ODS needs to notify WT-1 concerning the availability of excess ODS not claimed by other Federal agencies.

If used ODS are to be disposed of (*i.e.*, they are not going to be used, reused, or reclaimed), then the DOE organization responsible for the chemicals is responsible for determining whether it meets the definition of a RCRA hazardous waste.³⁹ Although a number of Class I ODS (*i.e.*, Carbon tetrachloride, Methyl chloroform, CFC-11, CFC-12 and CFC-113) are "hazardous constituents" under RCRA, used ODS may or may not meet the criteria for RCRA hazardous waste. The owning DOE organization is responsible for determining whether it is hazardous waste. The most likely scenario in which an ozone-depleting chemical would be subject to RCRA would be the situation for which: (a) the used chemical is headed for disposal, and (b) it exhibits a characteristic of hazardous waste (*e.g.*, toxicity, ignitability). For instance, a used ozone-depleting chemical that is, or contains, Carbon tetrachloride, or that contains chloroform above hazardous threshold levels (see 40 *CFR* 261.24, Toxicity characteristic), or that is a chemical that exhibits the hazardous characteristic of ignitability (see 40 *CFR* 261.24, Toxicity characteristic), <u>must</u> be managed as RCRA hazardous waste.⁴⁰

Under the Montreal Protocol, unused supplies of ODS must be destroyed using acceptable technology once they are no longer required for servicing existing equipment. For the foreseeable future, most Class I ODS will likely be needed for servicing existing equipment, so that disposal and destruction will not pose immediate concerns for most users. However, refrigerants and Halons will need to be properly destroyed if they are so radioactively-contaminated that they can no longer be effectively cleaned and used. Halons can only be disposed of by sending them to a recycler, or by arranging for their destruction by using one of the controlled destruction processes identified at 40 *CFR* Part 82, Subpart H ("Halon Emissions Reduction"), Section 82.270(e) (such as liquid injection incineration, or an EPA-approved destruction technology that achieves a destruction efficiency of 98% or greater). EPA has not issued regulations for the disposal or destruction of CFCs, beyond requiring that CFCs be removed from equipment before equipment disposal (as required by the EPA "Recycling and Emissions Reduction" regulations of 40 *CFR* Part 82, Subpart F). DOE has significant experience in managing waste and should be well-positioned to manage the destruction of its

³⁸ The requirements on DOE facilities for reporting excess personal property specify that all excess with an original acquisition cost of \$5,000 be entered into the DOE Energy Asset Disposal System for utilization screening within the Department.

³⁹ Refrigerants that are used or reused *without prior reclamation* are not subject to regulation under the RCRA hazardous waste program [40 *CFR* Section 261.2(e)(1)(ii)]. Also, used CFC refrigerants from totally enclosed heat transfer equipment that *are reclaimed* for further used are not RCRA hazardous wastes [40 *CFR* Section 261.4(b)(12)].

⁴⁰ Questions concerning the applicability of RCRA regulations to used ODS can be directed to Bill Fortune of EH-41 (202-586-7302; e-mail: *william.fortune@eh.doe.gov*).

unwanted Class I ODS. To obtain information on the destruction of ODS, the DOE organization responsible for the ODS should contact DOE's Office of Integration and Disposition (EM-20).

Used Class I or Class II refrigerant removed from refrigeration and air conditioning appliances that will be used to service non-DOE equipment may not be sold outside of DOE unless it has been reclaimed (*i.e.*, cleaned to the Air-Conditioning and Refrigeration Institute (ARI) Standard 700-1993). This probably would entail selling the refrigerant to a reclaimer, as Figure 1 also indicates. However, per 40 *CFR* Section 82.154(g) and (h), this refrigerant reclaiming requirement does not apply to refrigerants used in a motor vehicle air conditioner (MVAC), nor to refrigerants in an appliance that is sold together with the refrigerant. If the refrigerant was used only in a MVAC and will be used in another MVAC, it should be cleaned to meet the purity requirements of the EPA MVAC regulations at 40 *CFR* Part 82, Subpart B ("Servicing of Motor Vehicle Air Conditioners"). The DOE organization responsible for the ODS would also need to comply with other requirements in Subpart B concerning the sale of Class I or Class II ODS used in a MVAC. The owning DOE organization may then offer the excess chemicals for sale.

In the disposition of unwanted Class I ODS, managers responsible for the ODS should ensure that it is undertaken in a manner that would comply with the CAA and the Montreal Protocol. Deliberate venting of excess refrigerants as a disposal method is prohibited by Section 608(c) of the CAA and EPA's 40 *CFR* Part 82, Subpart F regulations and is totally unacceptable from the environmental standpoint. Likewise, the intentional venting of Halon (with several exemptions) is prohibited by EPA's 40 *CFR* Part 82, Subpart H rule.

APPENDIX A

EO 13148 OZONE-DEPLETING SUBSTANCES REDUCTION GOALS AND REQUIREMENTS

Sec. 206. Reductions in Ozone-Depleting Substances. Through evaluating present and future uses of ozone-depleting substances and maximizing the purchase and the use of safe, cost effective, and environmentally preferable alternatives, each agency shall develop a plan to phase out the procurement of Class I ozone-depleting substances for all nonexcepted uses by December 31, 2010.

Sec. 505. Reductions in Ozone-Depleting Substances. To attain the goals of section 206 of this order:

- (a) Each agency shall ensure that its facilities: (1) maximize the use of safe alternatives to ozone-depleting substances, as approved by the EPA's Significant New Alternatives Policy (SNAP) program; (2) consistent with subsection (b) of this section, evaluate the present and future uses of ozone-depleting substances, including making assessments of existing and future needs for such materials, and evaluate use of, and plans for recycling, refrigerants, and halons; and (3) exercise leadership, develop exemplary practices, and disseminate information on successful efforts in phasing out ozone-depleting substances.
- (b) Within 12 months of the date of this order, each agency shall develop a plan to phase out the procurement of Class I ozone-depleting substances for all nonexcepted uses by December 31, 2010. Plans should target cost effective reduction of environmental risk by phasing out Class I ozone depleting substance applications as the equipment using those substances reaches its expected service life. Exceptions to this requirement include all exceptions found in current or future applicable law, treaty, regulation, or Executive order.
- (c) Each agency shall amend its personal property management policies and procedures to preclude disposal of ozone depleting substances removed or reclaimed from its facilities or equipment, including disposal as part of a contract, trade, or donation, without prior coordination with the Department of Defense (DoD). Where the recovered ozonedepleting substance is a critical requirement for DoD missions, the agency shall transfer the materials to the DoD. The DoD will bear the costs of such transfer.

Sec. 703. Ozone-Depleting Substances. Each agency shall follow the policies and procedures for the acquisition of items that contain, use, or are manufactured with ozone-depleting substances in accordance with FAR section 23.8 and other applicable FAR provisions.

APPENDIX B

LIST OF CLASS I AND CLASS II OZONE-DEPLETING SUBSTANCES REGULATED BY THE EPA IN TITLE VI, "STRATOSPHERIC OZONE PROTECTION" OF THE CLEAN AIR ACT

CLASS I SUBSTANCES

COMMON TRADE NAME ¹	CHEMICAL FORMULA	CHEMICAL NAME
CFC-11	CCl₃F	Trichlorofluoromethane
CFC-12	CCl ₂ F ₂	Dichlorodifluoromethane
CFC-13	CCIF ₃	Chlorotrifluoromethane
CFC-111	C ₂ Cl ₅ F	Pentachlorofluoroethane
CFC-112	C ₂ Cl ₄ F ₂	Tetrachlorodifluoroethane
CFC-113	C ₂ Cl ₃ F ₃	Trichlorotrifluoroethane
CFC-114	C ₂ Cl ₂ F ₄	Dichlorotetrafluoroethane
CFC-115	C ₂ CIF ₅	Chloropentafluoroethane
CFC-211	C ₃ Cl ₇ F	Heptachlorofluoropropane
CFC-212	$C_3CI_6F_2$	Hexachlorodifluoropropane
CFC-213	C ₃ Cl ₅ F ₃	Pentachlorotrifluoropropane
CFC-214	$C_3CI_4F_4$	Tetrachlorotetrafluoropropane
CFC-215	C ₃ Cl ₃ F ₅	Trichloropentafluoropropane
CFC-216	C ₃ Cl ₂ F ₆	Dichlorohexafluoropropane
CFC-217	C ₃ CIF ₇	Chloroheptafluoropropane
Carbon tetrachloride	CCl₄	Tetrachloromethane
Methyl bromide	CH₃Br	Methyl bromide
Methyl chloroform	C ₂ H ₃ Cl ₃	1,1,1-trichloroethane
Halon-1211	CBrCIF ₂	Bromochlorodifluoromethane
Halon-1301	CBrF ₃	Bromotrifluoromethane
Halon-2402	$C_2F_4Br_2$	Dibromotetrafluoroethane
N/A	CHFBr ₂	Dibromofluoromethane
HBFC-22B1	CHF ₂ Br	Bromodifluoromethane
N/A	CH₂FBr	Bromofluoromethane
N/A	C ₂ HFBr ₄	Tetrabromofluoroethane
N/A	C ₂ HF ₃ Br ₂	Tribromodifluoroethane
N/A	C ₂ HF ₃ Br ₂	Dibromotrifluoroethane
N/A	C ₂ HF ₄ Br	Bromotetrafluoroethane
N/A	C ₂ H ₂ FBr ₃	Tribromofluoroethane

CLASS I SUBSTANCES (CONTINUED)

COMMON TRADE NAME ¹	CHEMICAL FORMULA	CHEMICAL NAME
N/A	$C_2H_2F_2Br_2$	Dibromodifluoroethane
N/A	C ₂ H ₂ F ₃ Br	Bromotrifluoroethane
N/A	C ₂ H ₃ FBr ₂	Dibromofluoroethane
N/A	C ₂ H ₃ F ₂ Br	Bromodifluroethane
N/A	C ₂ H ₄ FBr	Bromofluoroethane
N/A	C ₃ HFBr ₆	Hexabromofluoropropane
N/A	C ₃ HF ₂ Br ₅	Pentabromodifluoropropane
N/A	C ₃ HF ₃ Br ₄	Tetrabromotrifluoropropane
N/A	C ₃ HF ₄ Br ₃	Tribromotetrafluoropropane
N/A	C ₃ HF ₅ Br ₂	Dibromopentafluoropropane
N/A	C ₃ HF ₆ Br	Bromohexafluoropropane
N/A	C ₃ H ₂ FBr ₅	Pentabromofluoropropane
N/A	$C_3H_2F_2Br_4$	Tetrabromodifluoropropane
N/A	C ₃ H ₂ F ₃ Br ₃	Tribromotrifluoropropane
N/A	$C_3H_2F_4Br_2$	Dibromotetrafluoropropane
N/A	C ₃ H ₂ F ₅ Br	Bromopentafluoropropane
N/A	C ₃ H ₃ FBr ₄	Tetrabromofluoropropane
N/A	$C_3H_3F_2Br_3$	Tribromodifluoropropane
N/A	$C_3H_3F_3Br_2$	Dibromotrifluoropropane
N/A	C₃H₃F₄Br	Bromotetrafluoropropane
N/A	C ₃ H ₄ FBr ₃	Tribromofluoropropane
N/A	$C_3H_4F_2Br_2$	Dibromodifluoropropane
N/A	C ₃ H ₄ F ₃ Br	Bromotrifluoropropane
N/A	C₃H₅FBr₂	Dibromofluoropropane
N/A	C ₃ H ₅ F ₂ Br	Bromodifluoropropane
N/A	C₃H ₆ FBr	Bromofluoropropane

 $^{^{1}}$ Some notations may replace "CFC" and "HCFC" with an "R" (designating the substance as a refrigerant), or with "Freon" (which is a trade name).

CLASS II SUBSTANCES

COMMON TRADE NAME ¹	CHEMICAL FORMULA	CHEMICAL NAME
HCFC-21	CHCl₂F	Dichlorofluoromethane
HCFC-22	CHCIF ₂	Chlorodifluoromethane
HCFC-31	CH₂FCI	Chlorofluoromethane
HCFC-121	C ₂ HCl ₄ F	Tetrachlorofluoroethane
HCFC-122	C ₂ HCl ₃ F ₂	Trichlorodifluoroethane
HCFC-123	C ₂ HCl ₂ F ₃	Dichlorotrifluoroethane
HCFC-124	C ₂ HCIF ₄	Chlorotetrafluoroethane
HCFC-131	C ₂ H ₂ Cl ₃ F	Trichlorofluoroethane
HCFC-132B	$C_2H_2CI_2F_2$	Dichlorodifluoroethane
HCFC-133A	C ₂ H ₂ CIF ₃	Chlorotrifluoroethane
HCFC-141B	C ₂ H ₃ Cl ₂ F	Dichlorofluoroethane
HCFC-142B	C ₂ H ₃ CIF ₂	Chlorodifluoroethane
HCFC-221	C ₃ HCl ₆ F	Hexachlorofluoropropane
HCFC-222	C ₃ HCl ₅ F ₂	Pentachlorodifluoropropane
HCFC-223	C ₃ HCl ₄ F ₃	Tetrachlorotrifluoropropane
HCFC-224	C ₃ HCl ₃ F ₄	Trichlorotetrafluoropropane
HCFC-225CA	C ₃ HCl ₂ F ₅	Dichloropentafluoropropane
HCFC-225CB	C ₃ HCl ₂ F ₅	Dichloropentafluoropropane
HCFC-226	C ₃ HCIF ₆	Chlorohexafluoropropane
HCFC-231	C ₃ H ₂ Cl ₅ F	Pentachlorofluoropropane
HCFC-232	$C_3H_2CI_4F_2$	Tetrachlorodifluoropropane
HCFC-233	C ₃ H ₂ Cl ₃ F ₃	Trichlorotrifluoropropane
HCFC-234	$C_3H_2CI_2F_4$	Dichlorotetrafluoropropane
HCFC-235	C ₃ H ₂ CIF ₅	Chloropentafluoropropane
HCFC-241	C ₃ H ₃ Cl ₄ F	Tetrachlorofluoropropane
HCFC-242	$C_3H_3CI_3F_2$	Trichlorodifluoropropane
HCFC-243	$C_3H_3Cl_2F_3$	Dichlorotrifluoropropane
HCFC-244	C ₃ H ₃ CIF ₄	Chlorotetrafluoropropane
HCFC-251	C ₃ H ₄ Cl ₃ F	Trichlorofluoropropane
HCFC-252	$C_3H_4CI_2F_2$	Dichlorodifluoropropane
HCFC-253	C ₃ H ₄ CIF ₃	Chlorotrifluoropropane
HCFC-261	C ₃ H ₅ Cl ₂ F	Dichlorofluoropropane
HCFC-262	C ₃ H ₅ CIF ₂	Chlorodifluoropropane
HCFC-271	C ₃ H ₆ CIF	Chlorofluoropropane

¹ Some notations may replace "CFC" and "HCFC" with an "R" (designating the substance as a refrigerant), or with "Freon" (which is a trade name).

APPENDIX C

PRODUCTION PHASEOUT DATES FOR OZONE-DEPLETING SUBSTANCES REGULATED BY THE CLEAN AIR ACT

Ozone-Depleting Substance	PRODUCTION PHASEOUT DATE
Halons	January 1, 1994
Carbon tetrachloride	January 1, 1996
Chlorofluorocarbons (CFCs)	January 1, 1996
Hydrobromofluorocarbons (HBFCs)	January 1, 1996
Methyl chloroform	January 1, 1996
Methyl bromide	January 1, 2001
Hydrochlorofluorocarbon-141b (HCFC-141b)	January 1, 2003
Hydrochlorofluorocarbon-142b (HCFC-142b)	January 1, 2020
Hydrochlorofluorocarbon-22 (HCFC-22)	January 1, 2020
All other Hydrochlorofluorcarbons (HCFCs)	January 1, 2030

Accelerated ODS Production Phaseout Schedules

Consistent with the Montreal Protocol, Title VI of the Clean Air Act (CAA), Sections 601 through 607, established ODS production phaseout schedules for the United States, and called for the phaseout of most ODS by the year 2000, and all by 2030. In July 1992, the EPA issued a final rule implementing Section 606, which accelerated ODS production phaseout. The final rule is available at 40 *CFR* Part 82, Subpart A.

Class I substances destroy stratospheric ozone more readily than do Class II substances, *i.e.*, they have a greater ozone-depletion potential (ODP).¹ Production of Class I ODS is phased out first because their ODPs are high compared to Class II ODS. As shown in the table above, the production phaseout schedule for Class II ODS (HCFCs) extends until the year 2030, reflective of their significantly lower ODPs. HCFCs with relatively high ODPs (HCFC-141b, HCFC-142b, and HCFC-22) are scheduled for earlier Class II phaseout than other HCFCs with lower ODPs.

¹ ODP is the ratio of the impact on ozone of a chemical compared to the impact of a similar mass of CFC-11.

APPENDIX D

EPA STRATOSPHERIC OZONE PROTECTION REGULATIONS AND PROPERTY MANAGEMENT REGULATIONS RELEVANT TO THE PHASEOUT AND DISPOSITION OF OZONE-DEPLETING SUBSTANCES

REGULATION	CITATION
"Protection of Stratospheric Ozone, Production and Consumption Controls"	40 CFR Part 82, Subpart A
"Protection of Stratospheric Ozone, Servicing of Motor Vehicle Air Conditioners"	40 CFR Part 82, Subpart B
"Protection of Stratospheric Ozone, Ban on Nonessential Products Containing Class I Substances and Ban on Nonessential Products Containing or Manufactured with Class II Substances"	40 CFR Part 82, Subpart C
"Protection of Stratospheric Ozone, Federal Procurement"	40 CFR Part 82, Subpart D
"Protection of Stratospheric Ozone, the Labeling of Products Using Ozone -Depleting Substances"	40 CFR Part 82, Subpart E
"Protection of Stratospheric Ozone, Recycling and Emissions Reduction"	40 CFR Part 82, Subpart F
"Protection of Stratospheric Ozone, Significant New Alternatives Program"	40 CFR Part 82, Subpart G
"Protection of Stratospheric Ozone, Halon Emissions Reduction"	40 CFR Part 82, Subpart H
"Exchange/Sale Determination"	41 CFR Part 101-46.2
"Disposition of Excess Personal Property"	41 CFR Part 102-36.210
"Utilization of Excess"	41 CFR Part 109-43.3
"Utilization and Disposal of Personal Property Pursuant to Exchange/Sale"	41 CFR Part 109-46